Designation: D7999 – 15

Standard Classification for Rubber Products in Natural Gas Pipeline Applications[1]

This standard is issued under the fixed designation D7999; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This classification system covers the properties of vulcanized rubber materials (natural rubber, reclaimed rubber, synthetic robbers, alone or in combination) that are intended for use in rubber products found in natural gas pipeline applications (for example, elastomeric couplings, o-rings, quad seals, and diaphragms).

1.2 This classification system is based on the premise that the material properties of all rubber products can be arranged into characteristic material designations. These designations are determined by types and classes as described in Classification System D2000. For gas industry pipeline applications, materials can be further described using additional requirements herein in conjunction with Classification System D2000. It must be noted that there are other types of elastomers covered in Classification System D2000 that are not covered by this standard.

1.3 In all cases where the provisions of this classification system would conflict with those of the detailed specifications for a particular product, the latter shall take precedence.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D297 Test Methods for Rubber Products—Chemical Analysis

D471 Test Method for Rubber Property—Effect of Liquids

D573 Test Method for Rubber—Deterioration in an Air Oven

D1418 Practice for Rubber and Rubber Latices—Nomenclature

D1566 Terminology Relating to Rubber

D2000 Classification System for Rubber Products in Automotive Applications

D6370 Test Method for Rubber—Compositional Analysis by Thermogravimetry (TGA)

D8015 Test Method for Dimensional Changes of Elastomer and Rubber Materials Due to Exposure to Gaseous Hydrocarbon Environments

3. Terminology

3.1 *Definitions*—For definitions of technical terms pertaining to rubber used in this specification, see Terminology D1566.

3.2 *Definitions*—The nomenclature and abbreviations used for natural and synthetic rubbers are in accordance with Practice D1418.

4. Purpose

4.1 The purpose of this classification system is to provide guidance to the engineer in the selection of practical, commercially available rubber materials, and further to provide a method for specifying these materials by the use of a simple "line call-out" designation.

4.2 This classification system was developed to permit the addition of descriptive values for future rubber materials without complete reorganization of classification system and to facilitate the incorporation of future new test methods to keep pace with changing industry requirements.

5. Classification

5.1 Rubber materials shall be specified using the convention set forth in Classification System D2000 with additional rubber properties represented by supplemental suffix designations ZG_n as described in Table 1.

6. Basic Requirements

6.1 The basic requirements for the properties specified in this standard are based on values obtained from standard laboratory test specimens prepared and tested in accordance with the applicable ASTM test methods. *Test results from specimens prepared from finished products may not duplicate values obtained from standard test specimens.*

[1] This classification is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.30 on Classification of Rubber Compounds.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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TABLE 1 Meaning of Suffix Letters

Suffix Letter	Test Required
A	Heat Resistance
B	Compression Set
C	Ozone or Weather Resistance
D	Compression-Deflection Resistance
EA	A Fluid Resistance (Aqueous)
EF	F Fluid Resistance (Fuels)
EO	O Fluid Resistance (Oils and Lubricants)
F	Low-Temperature Resistance
G	Tear Resistance
H	Flex Resistance
J	Abrasion Resistance
K	Adhesion
M	Flammability Resistance
N	Impact Resistance
P	Staining Resistance
R	Resilience
ZG_1	Gaseous Effects
ZG_2	Solvent Extractable Contents
ZG_3	Filler and Carbon Black Content

TABLE 2 Supplemental Suffix Requirements Classification of Elastomeric Materials

	Suffix Requirements	All Grades	Type/Class AA, BF, BG BK
ZG_1	Gaseous Effects, Test Method D8015 Dimensional change, max%	4%	
ZG_2	Solvent Extractable Content Test Methods D297 Section 26, 30 min exposure, max%		10%
ZG_3	Carbon Black Content, Test Method D6370, %		40–50%

7. Suffix Requirements

7.1 Suffix requirements shall be specified *only as needed* to define qualities necessary to meet service requirements. Suffix letters and suffix numbers describing the suffix requirements may be used singly or in combination *but not all suffix values available for a given material need be specified.*

7.2 The supplemental suffix requirements for the ZG_n designations are shown in Table 2.

8. Line Call-Outs

8.1 A line call-out is the specification and shall follow Section 9 of Classification System D2000. Following is an example of line call out using the supplemental suffix requirements of Table 2.

Classification System D2000 M2BC 507 A14 EO34 ZG_1 ZG_2 ZG_3

ASTM D2000 = Standards Organization and Document Number

Basic Requirements:
M = Requirements are in SI Units.
2 = Applicable Suffix Grade.
B = Material Type based on Temperature Resistance.
C = Material Class based on IRM 903 Oil Volume Swell.
5 = x 10 is Type A Hardness (that is, 5 indicates requirement is 50).
07 = Tensile Strength ("M" in line call out indicates units are in MPa).

Suffix Requirements:
A14 = A – Heat Resistance; 1 – Test Method D573, 70 h; 4 – 100°C
EO34 = EO – Fluid Resistance in Oils and Lubricants; 3 – Test Method D471,
IRM 903 Oil, 70 h; 4 – 100°C; ZG1 = Gaseous Effect, Test Method D8015;
ZG_2 = Solvent Extractable Content; ZG_3 = Carbon Black Content

9. Test Methods

9.1 The applicable test methods are listed in Table 5 of Classification System D2000 and Table 2.

10. Sampling and Inspection

10.1 A lot, unless otherwise specified, shall consist of all products of the same material submitted for inspection at the same time.

10.2 When proof of conformance with a specification based on this classification system is required, the supplier shall, upon request of the purchaser at the time of ordering, furnish a sufficient number of samples to permit the performance of the required tests. Test specimens shall be prepared as prescribed in 6.1. The samples shall be warranted to have equivalent cure and to be from the same run or batch of compound used in the lot.

11. Keywords

11.1 elastomer; gas industry applications; pipeline; rubber

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